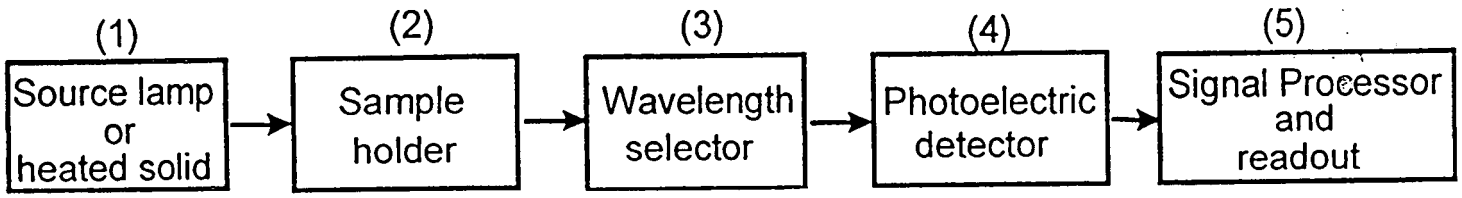

Figure 1

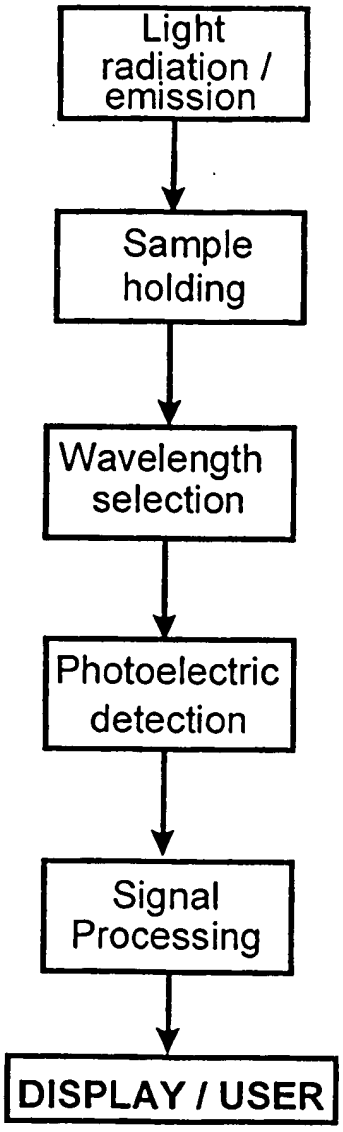

Figure 2a
(Prior Art)

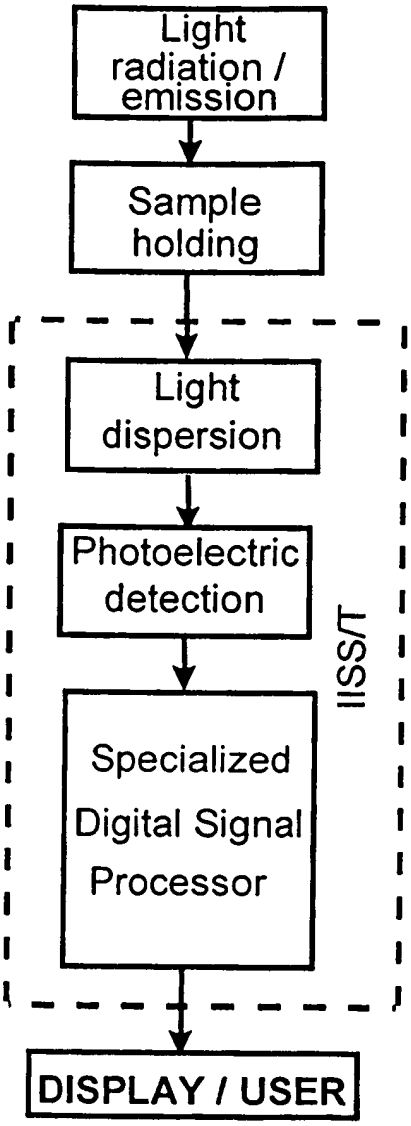

Figure 2b

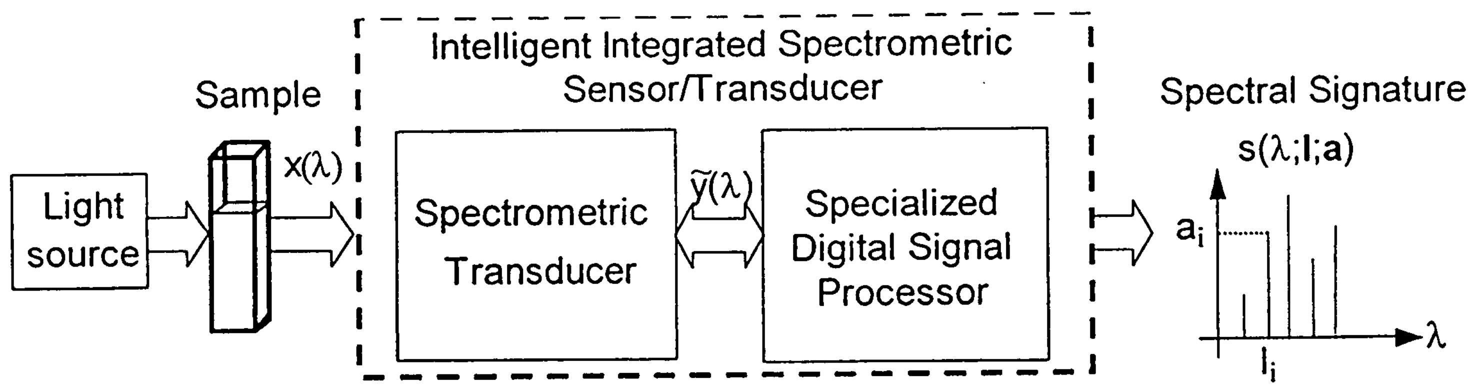
Light source
Sample
x(λ)
Intelligent Integrated Spectrometric Sensor/Transducer
Spectrometric Transducer
ỹ(λ)
Specialized Digital Signal Processor
Spectral Signature
s(λ;l;a)
a_i
l_i
λ

Figure 3

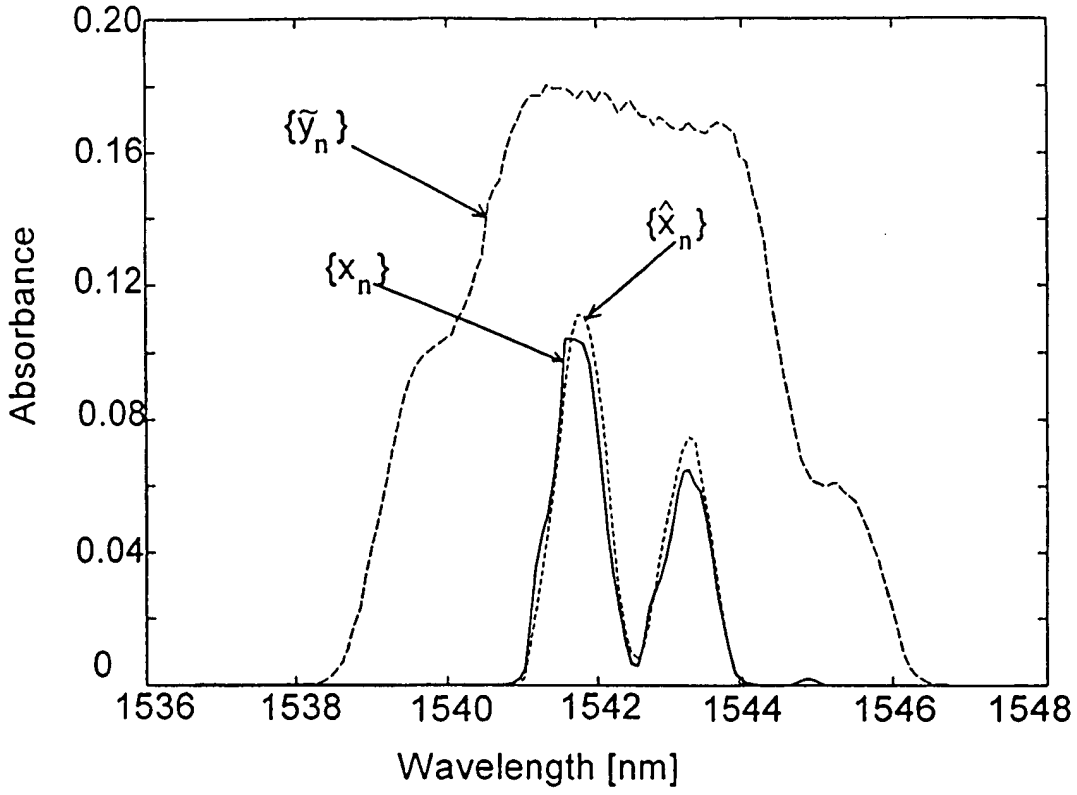
0.20
0.16
0.12
0.08
0.04
0
Absorbance
{ỹ_n}
{x̂_n}
{x_n}
1536
1538
1540
1542
1544
1546
1548
Wavelength [nm]

Figure 4

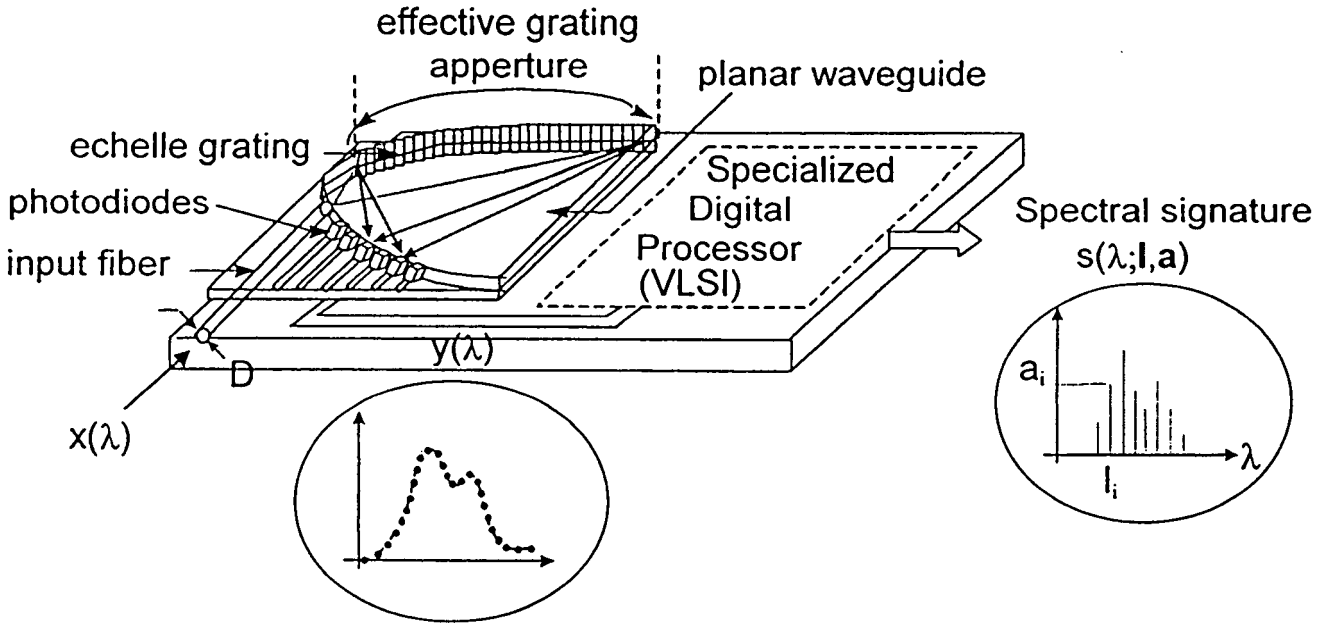

Figure 5

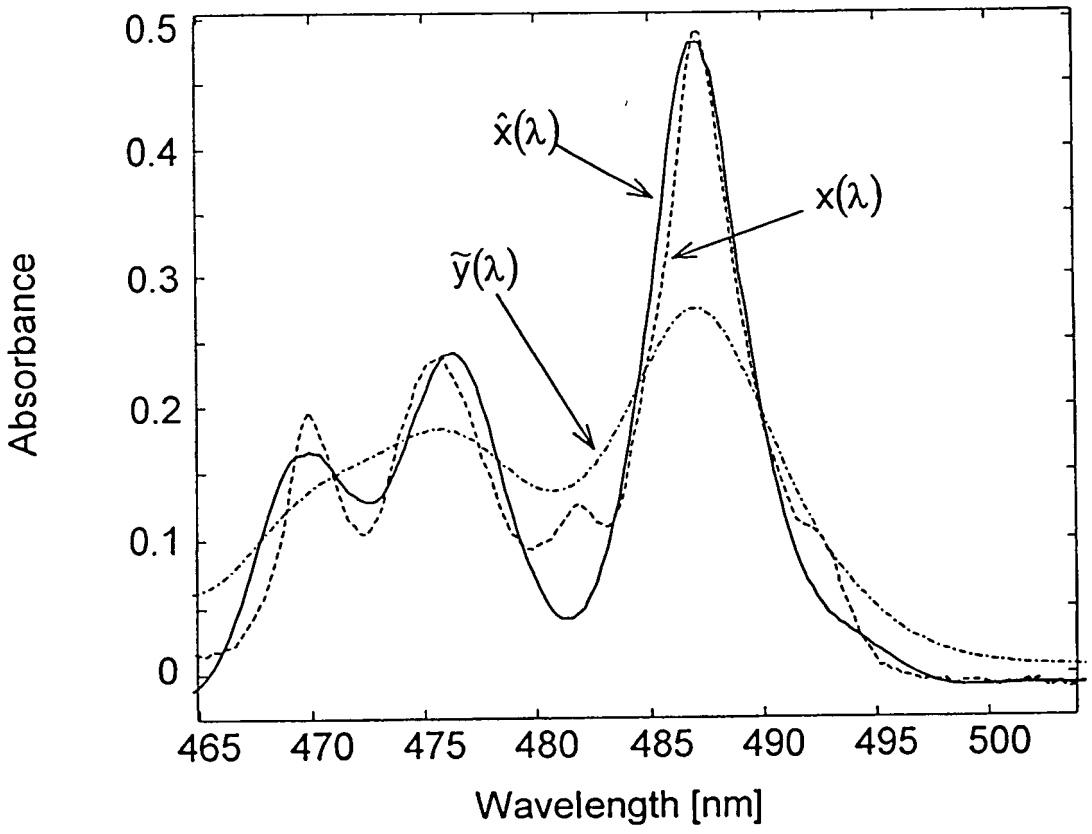
0.5
0.4
0.3
0.2
0.1
0
Absorbance
465
470
475
480
485
490
495
500
Wavelength [nm]
x̂(λ)
x(λ)
ỹ(λ)

Figure 6

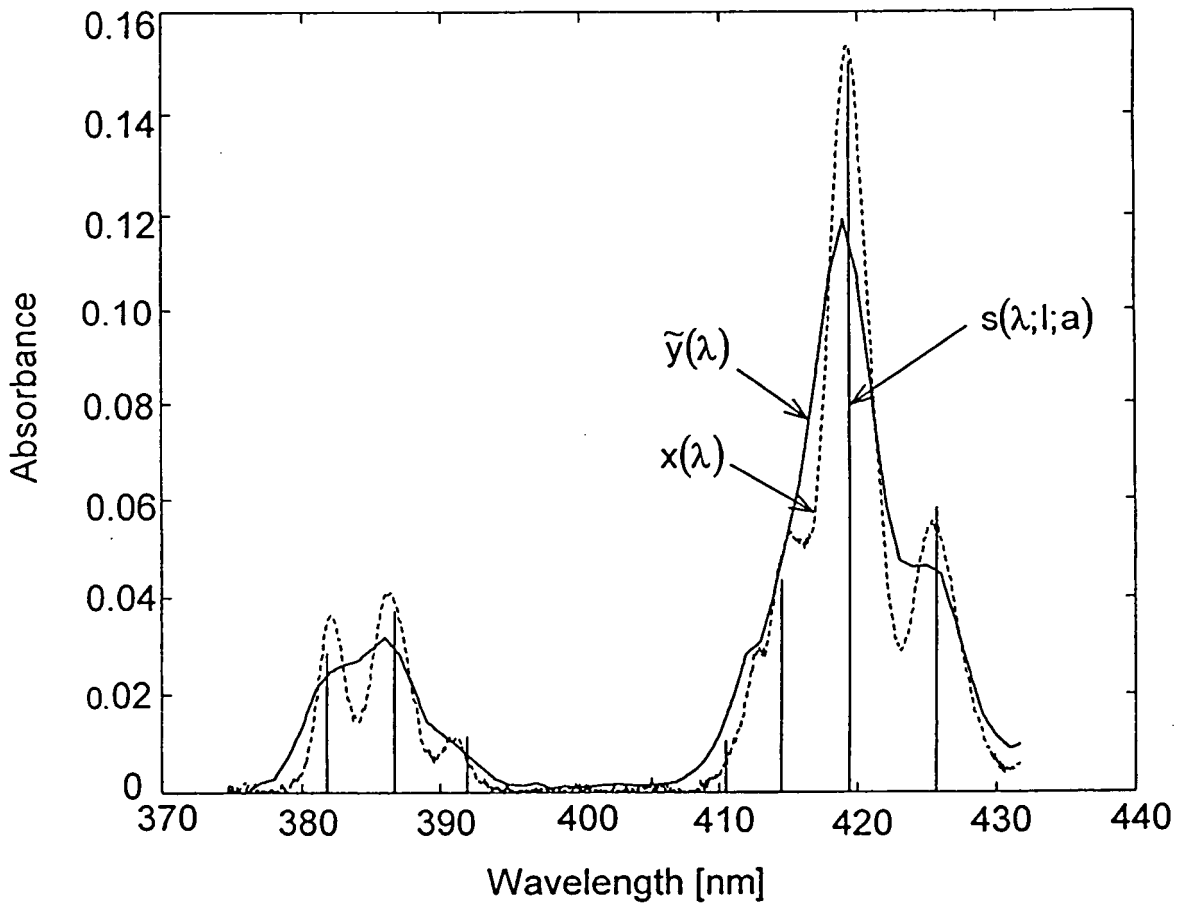

Figure 7

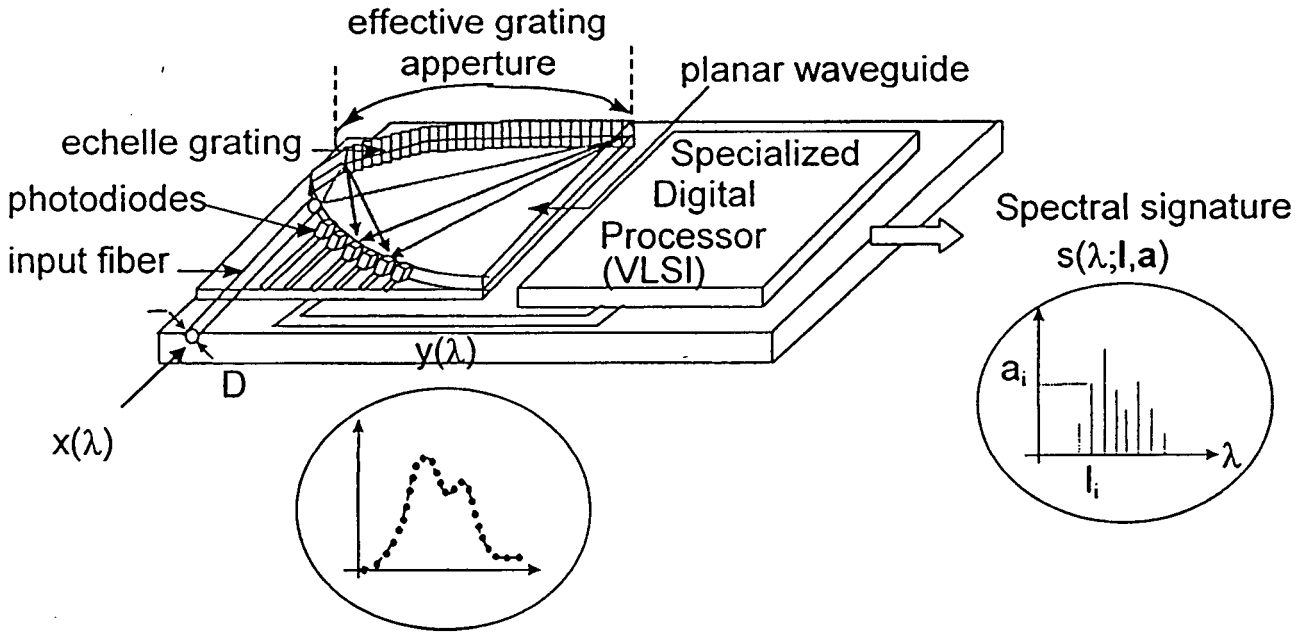

Figure 8

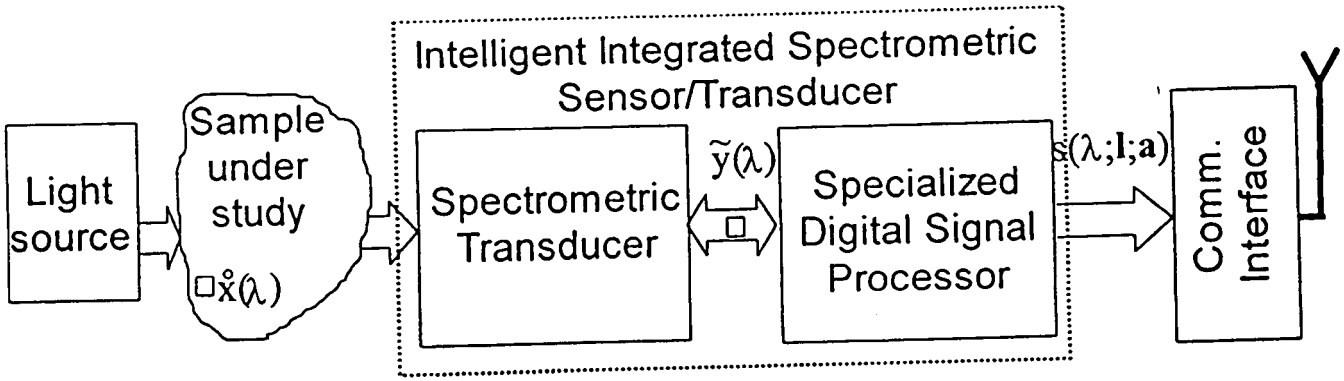
Intelligent Integrated Spectrometric Sensor/Transducer
Light source
Sample under study
$\hat{x}(\lambda)$
Spectrometric Transducer
$\tilde{y}(\lambda)$
Specialized Digital Signal Processor
$s(\lambda;\mathbf{l};\mathbf{a})$
Comm. Interface

Figure 9

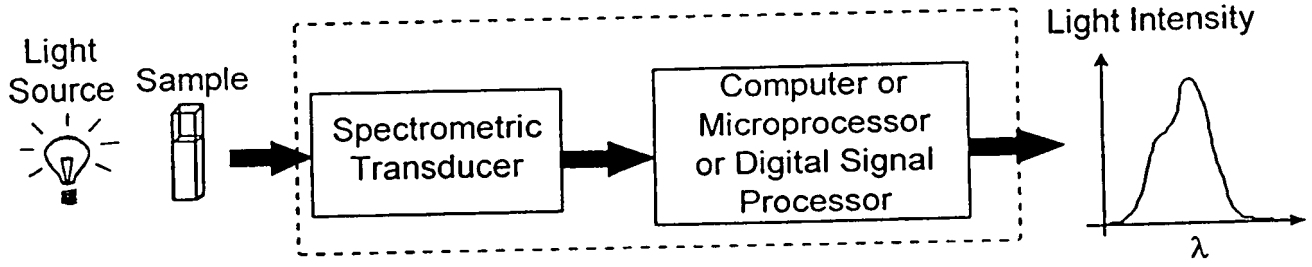

Figure 10

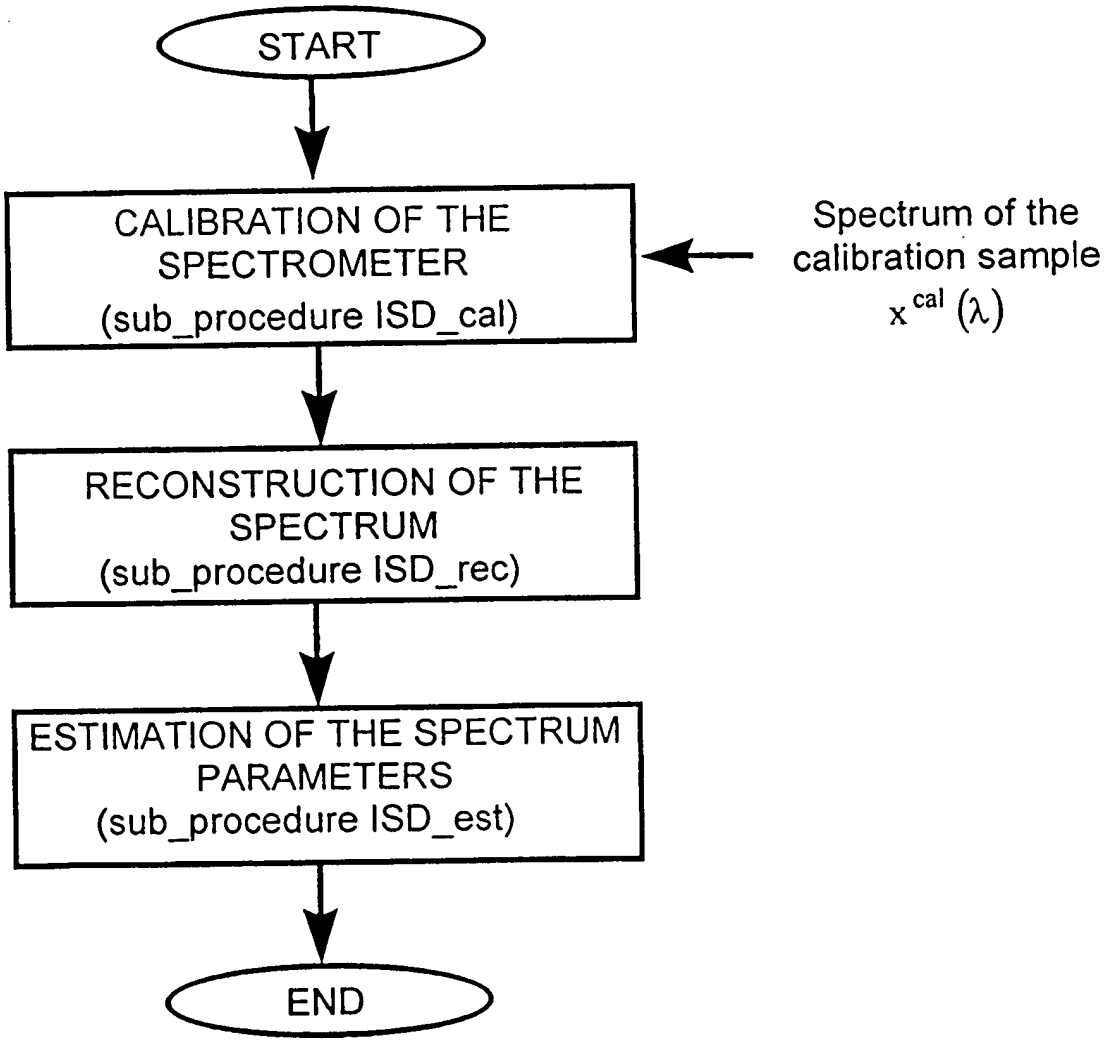
START
CALIBRATION OF THE SPECTROMETER
(sub_procedure ISD_cal)
Spectrum of the calibration sample
$x^{cal}(\lambda)$
RECONSTRUCTION OF THE SPECTRUM
(sub_procedure ISD_rec)
ESTIMATION OF THE SPECTRUM PARAMETERS
(sub_procedure ISD_est)
END

Figure 11a

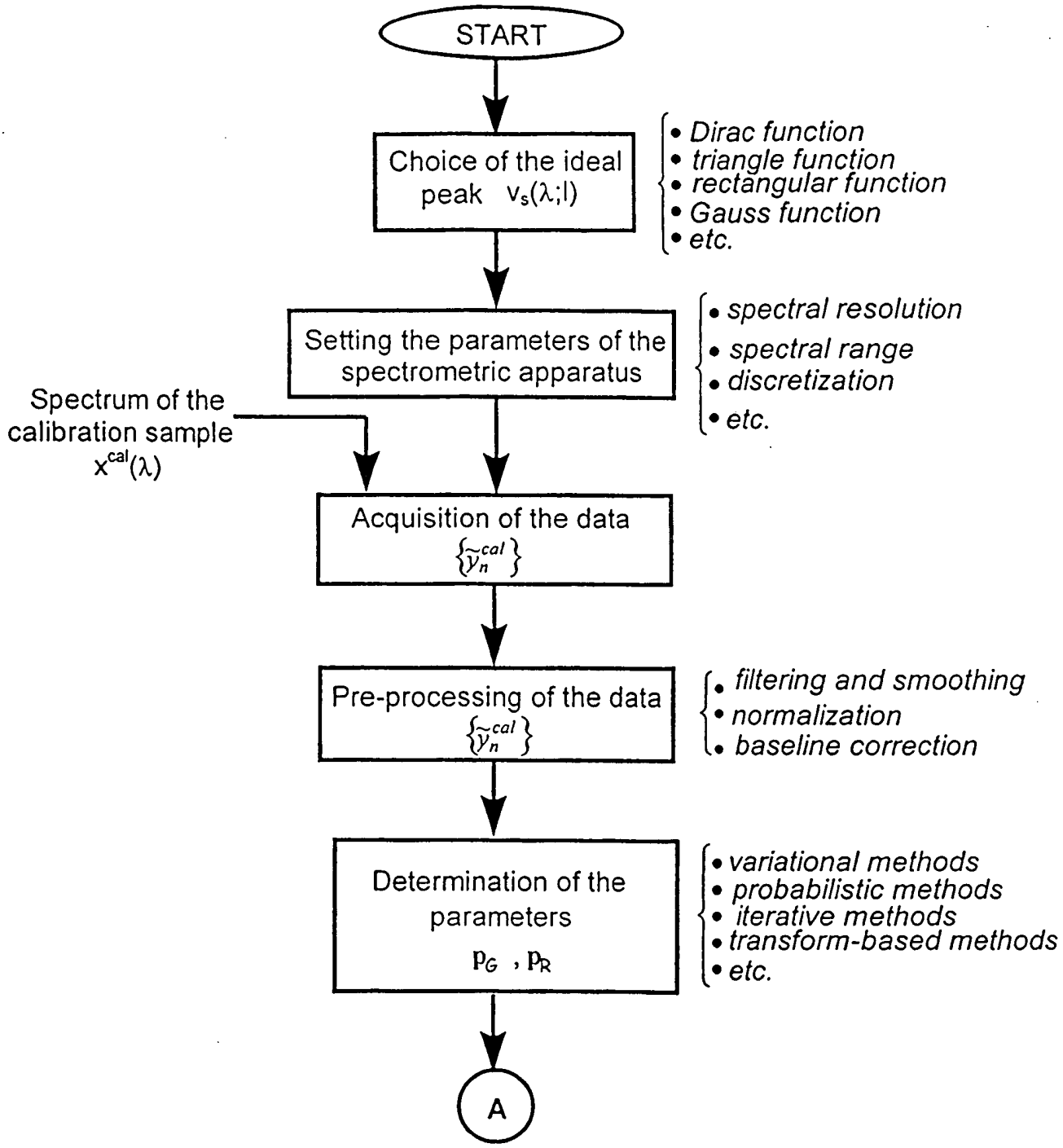
START
Choice of the ideal peak $v_s(\lambda;l)$
• Dirac function
• triangle function
• rectangular function
• Gauss function
• etc.
Setting the parameters of the spectrometric apparatus
• spectral resolution
• spectral range
• discretization
• etc.
Spectrum of the calibration sample $x^{cal}(\lambda)$
Acquisition of the data $\{\tilde{y}_n^{cal}\}$
Pre-processing of the data $\{\tilde{y}_n^{cal}\}$
• filtering and smoothing
• normalization
• baseline correction
Determination of the parameters p_G , p_R
• variational methods
• probabilistic methods
• iterative methods
• transform-based methods
• etc.
A

Figure 11b

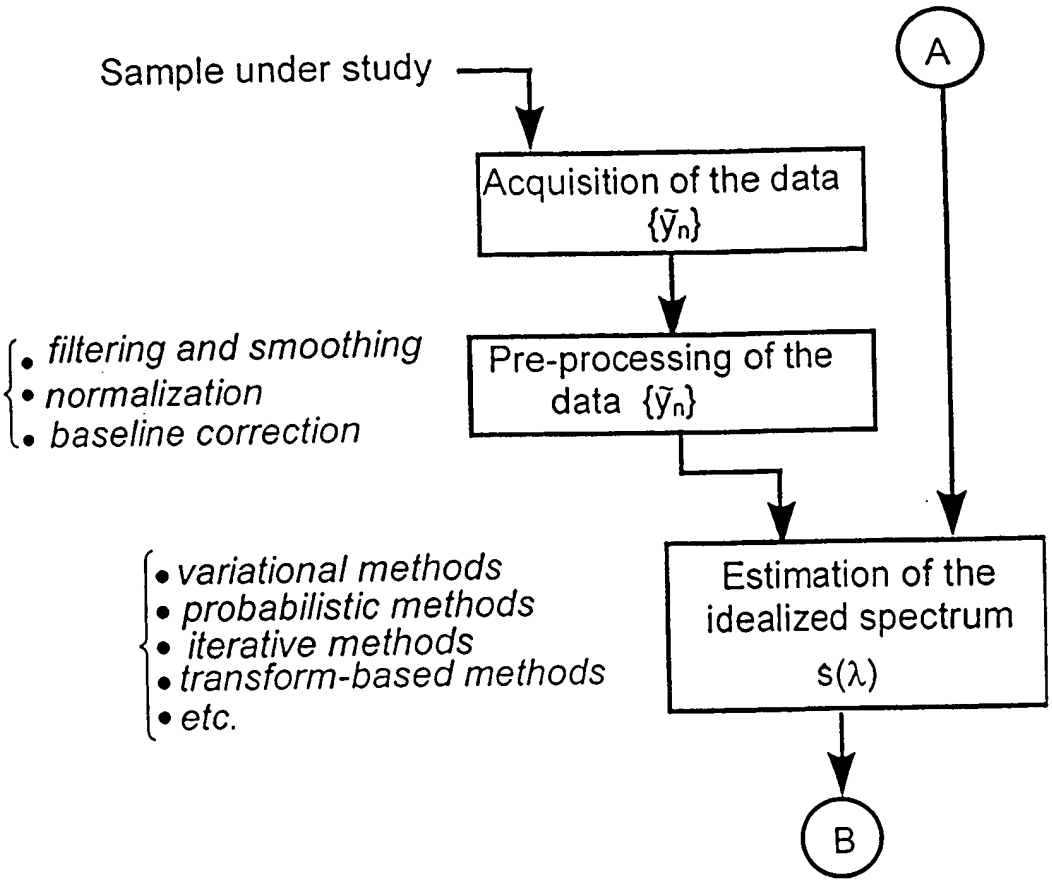
Sample under study
A
Acquisition of the data
{ỹn}
• filtering and smoothing
• normalization
• baseline correction
Pre-processing of the
data {ỹn}
• variational methods
• probabilistic methods
• iterative methods
• transform-based methods
• etc.
Estimation of the
idealized spectrum
s(λ)
B

Figure 11c

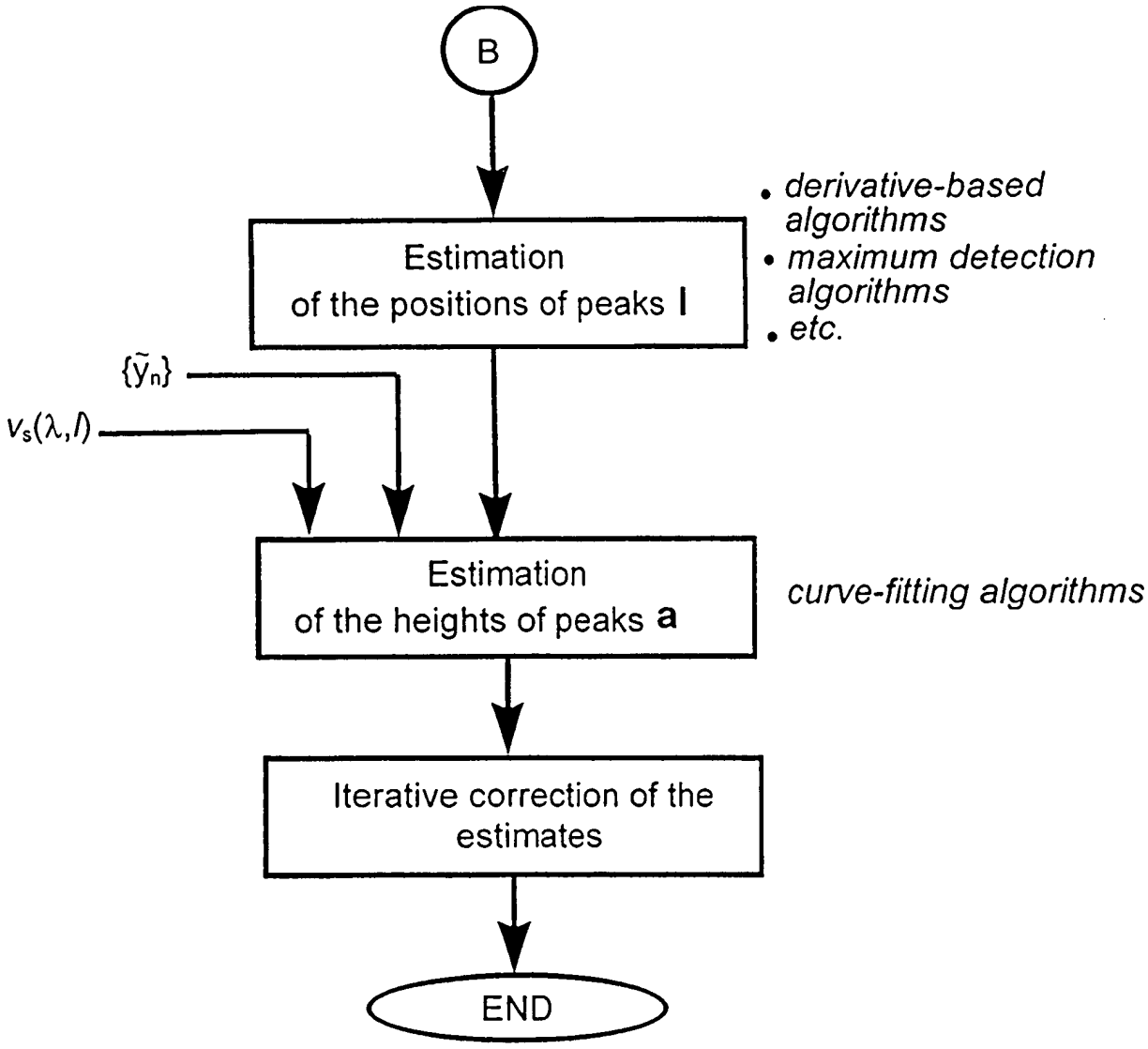
B
Estimation
of the positions of peaks l
• derivative-based algorithms
• maximum detection algorithms
• etc.
{ỹn}
vs(λ,l)
Estimation
of the heights of peaks a
curve-fitting algorithms
Iterative correction of the estimates
END

Figure 11d

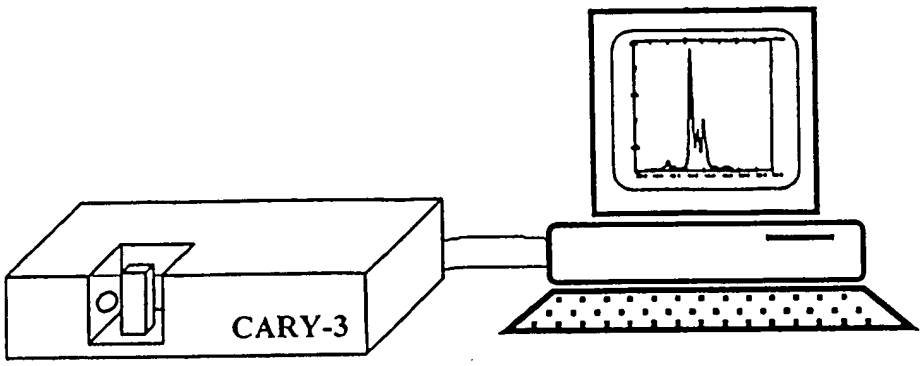

Figure 12

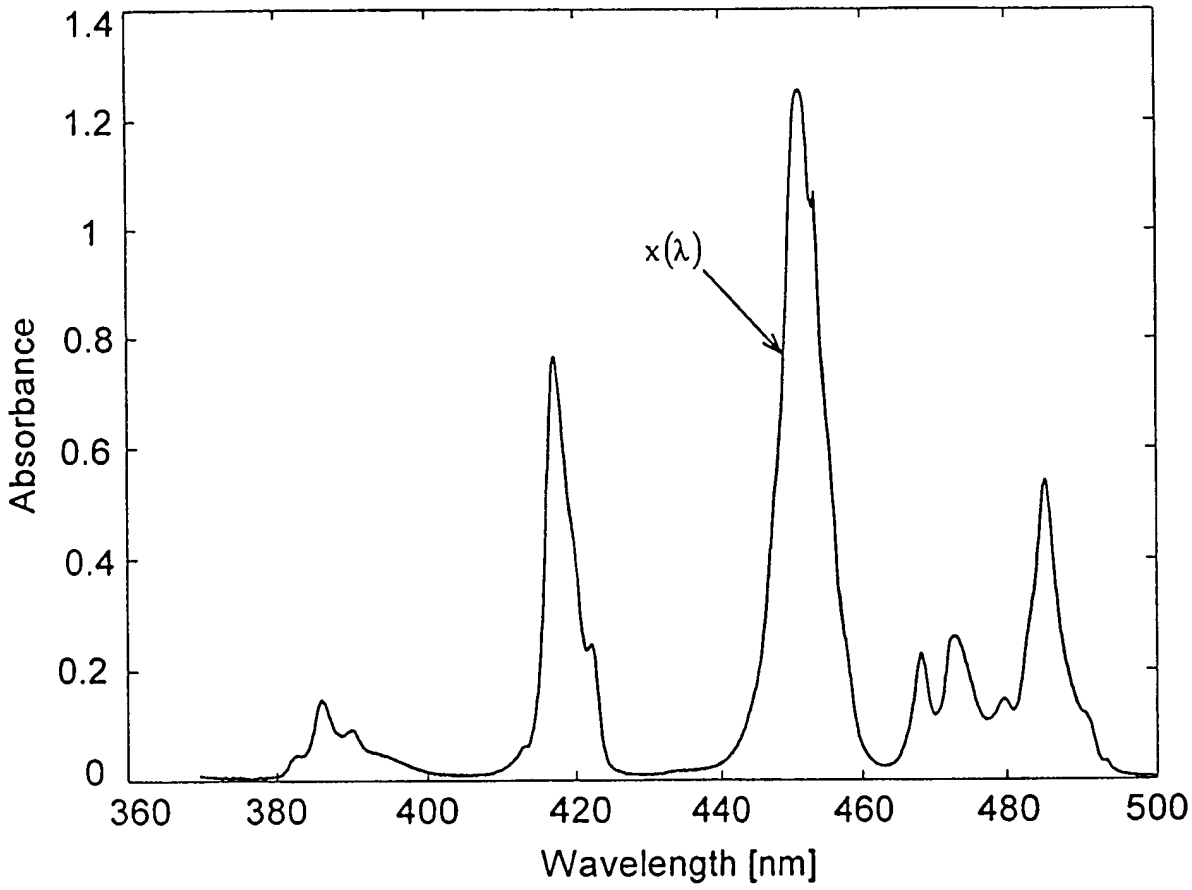
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Absorbance
x(λ)
360
380
400
420
440
460
480
500
Wavelength [nm]

Figure 13a

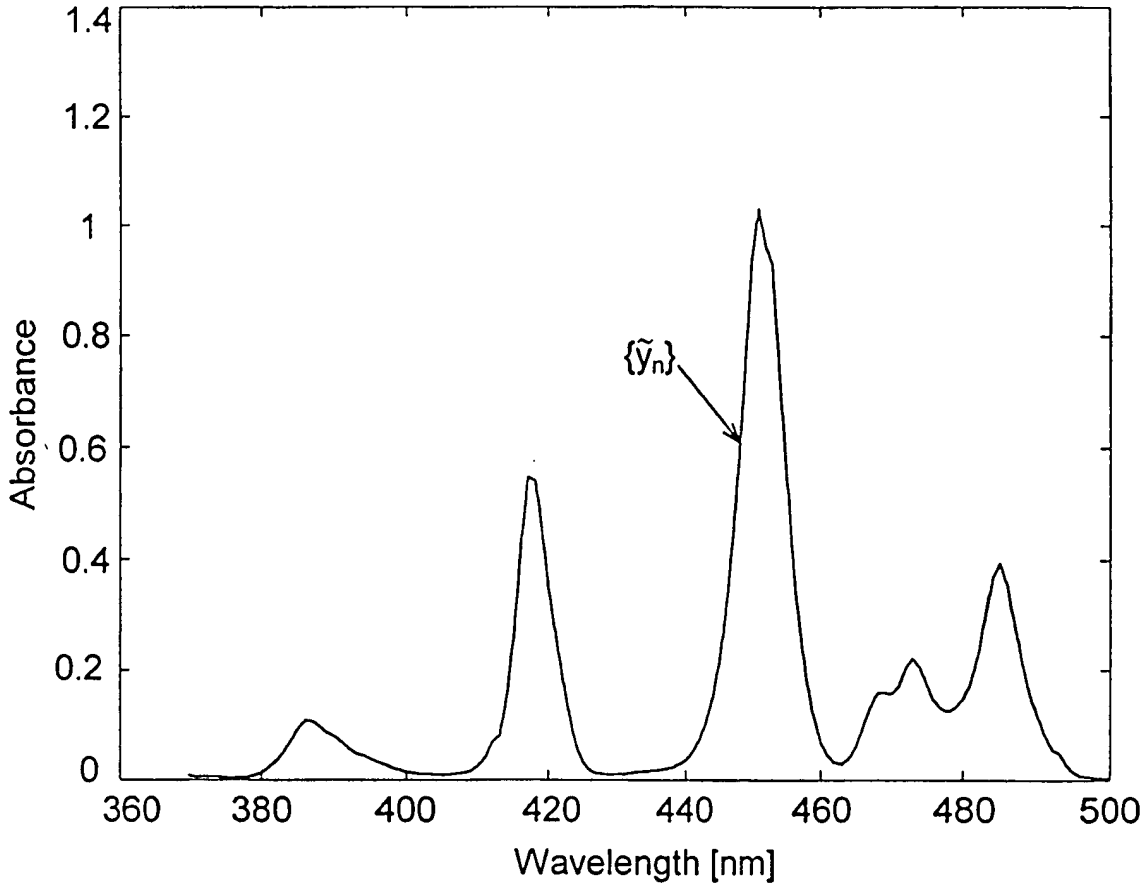
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Absorbance
{ỹn}
360
380
400
420
440
460
480
500
Wavelength [nm]

Figure 13b

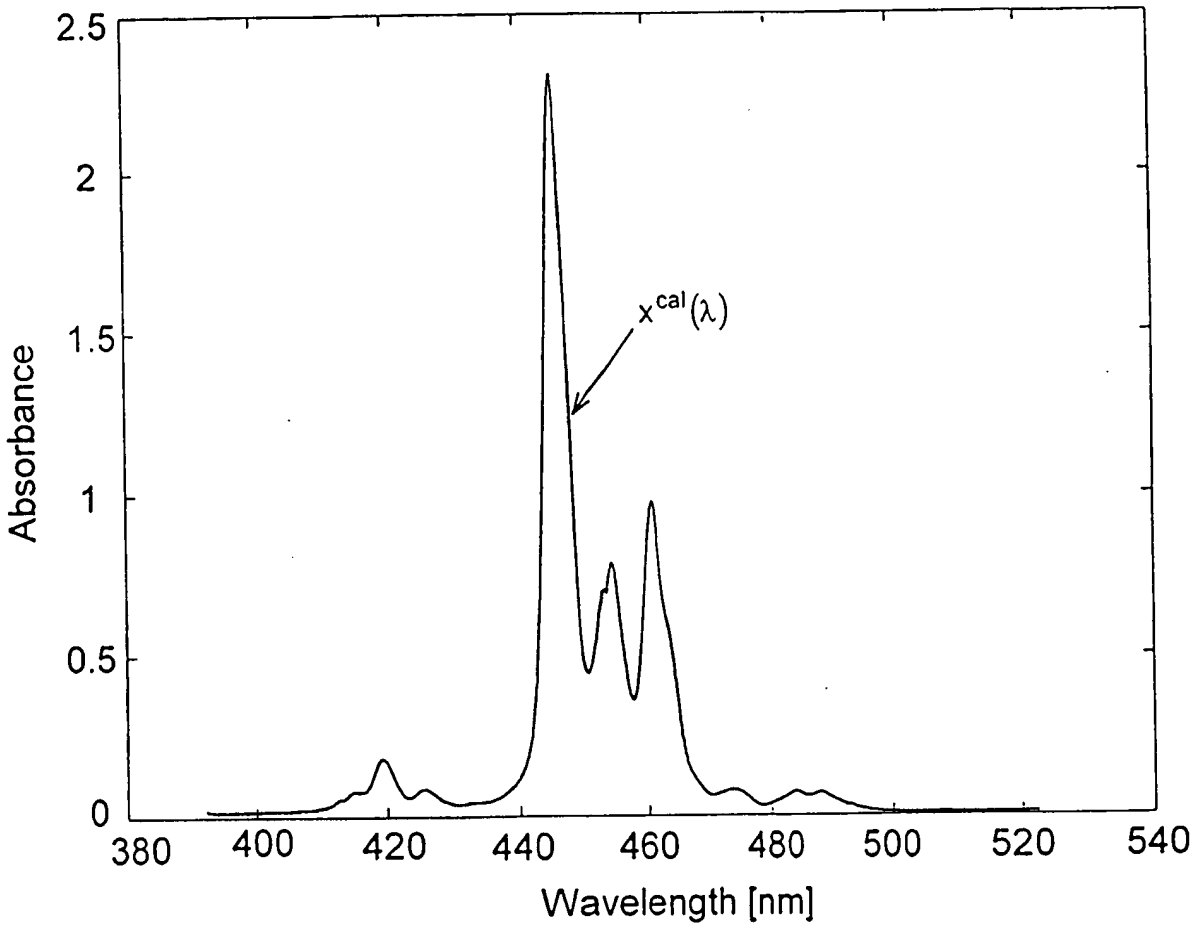
2.5
2
1.5
1
0.5
0
Absorbance
$x^{cal}(\lambda)$
380
400
420
440
460
480
500
520
540
Wavelength [nm]

Figure 14a

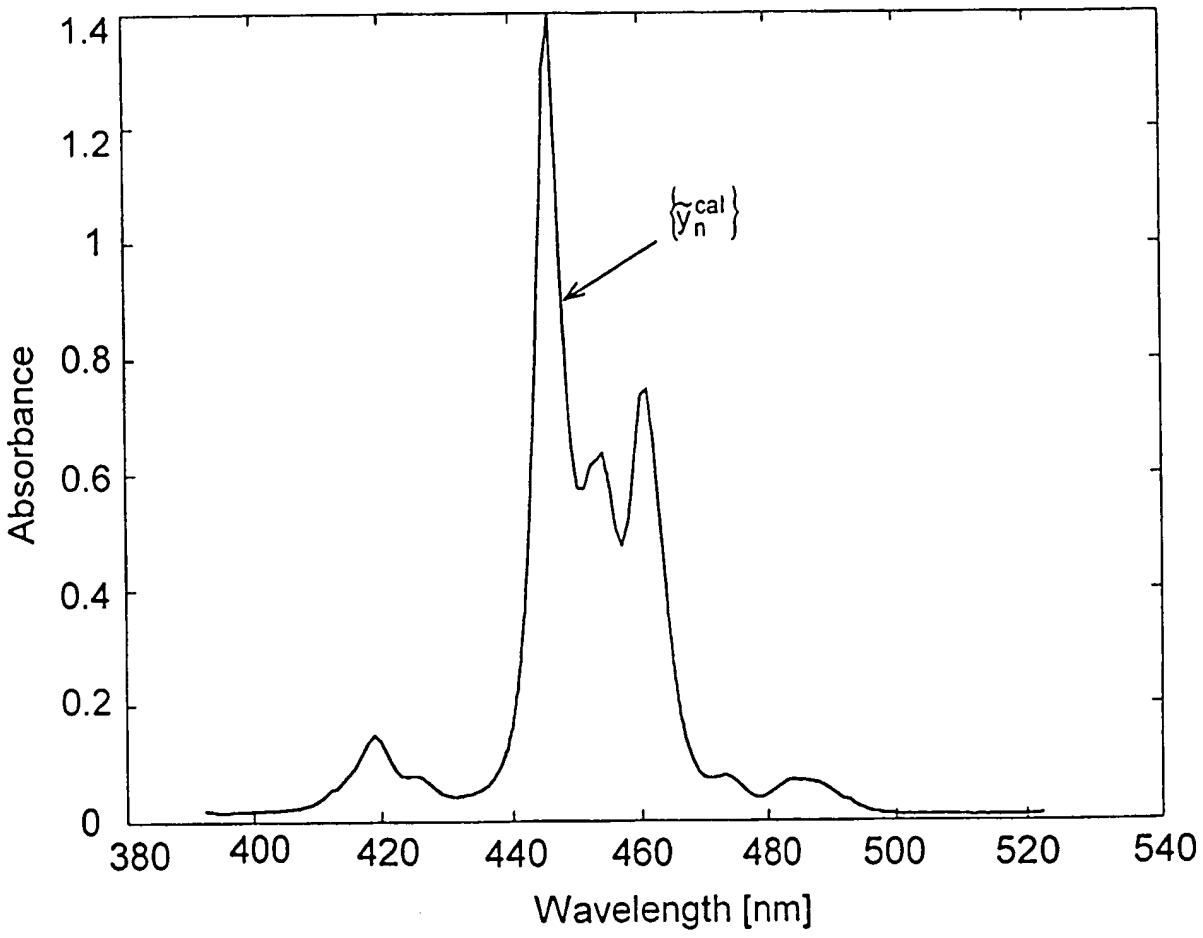
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Absorbance
380
400
420
440
460
480
500
520
540
Wavelength [nm]
$\{\tilde{y}_n^{cal}\}$

Figure 14b

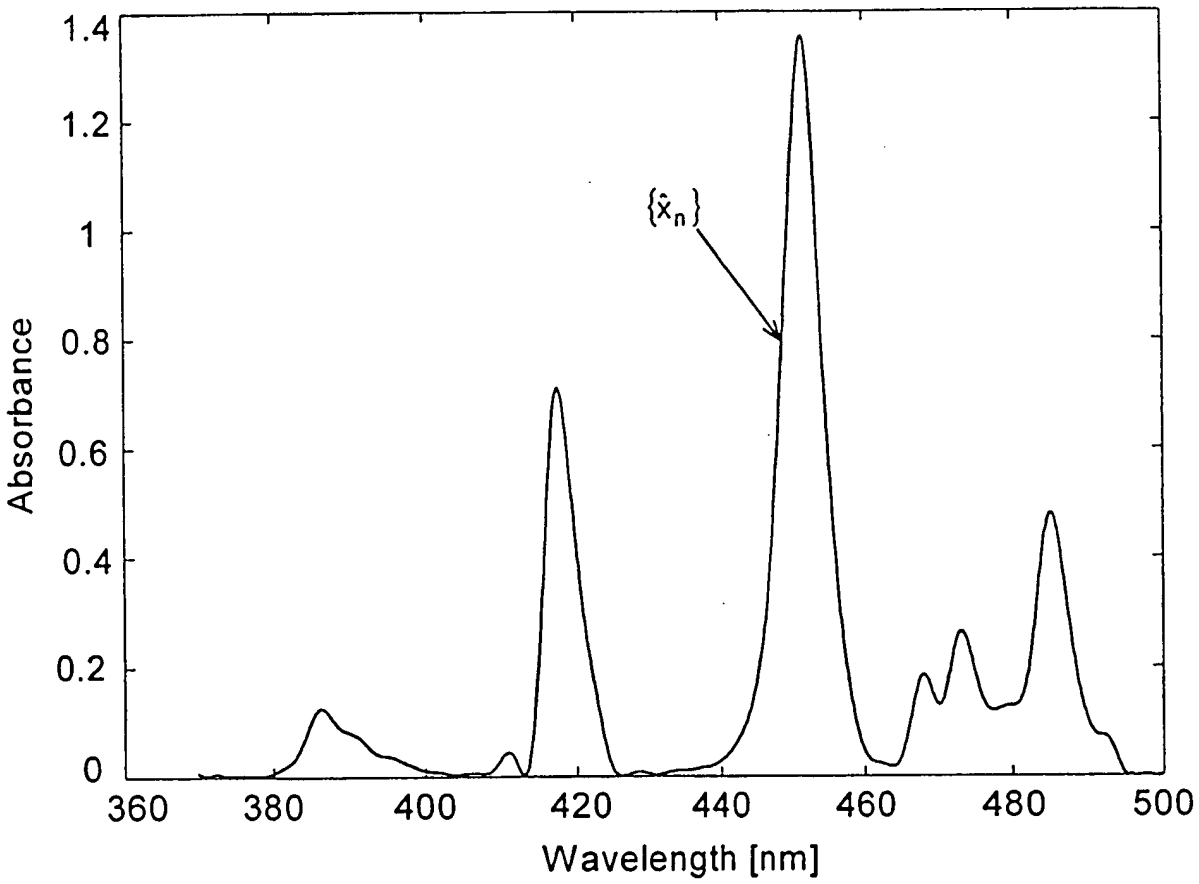
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Absorbance
$\{\hat{x}_n\}$
360
380
400
420
440
460
480
500
Wavelength [nm]

Figure 15a

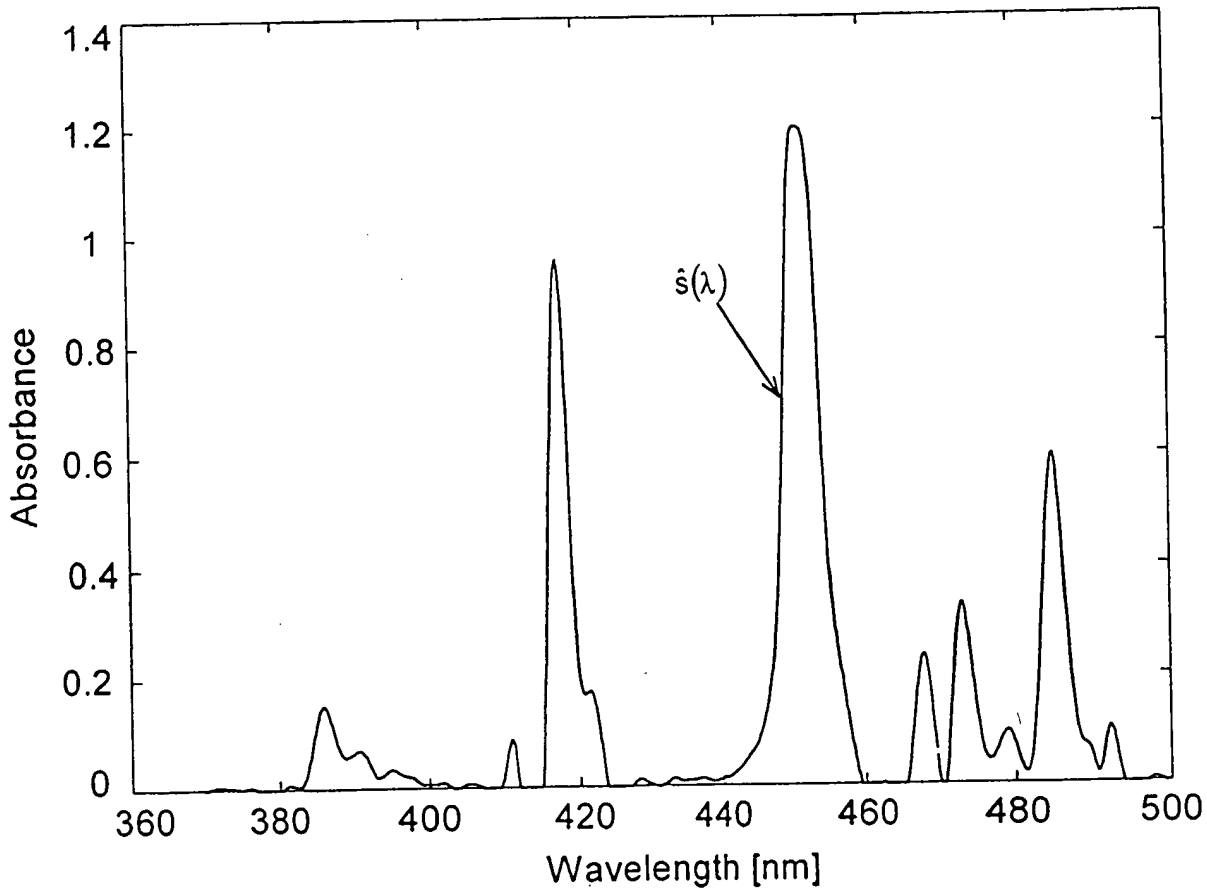
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Absorbance
ŝ(λ)
360
380
400
420
440
460
480
500
Wavelength [nm]

Figure 15b

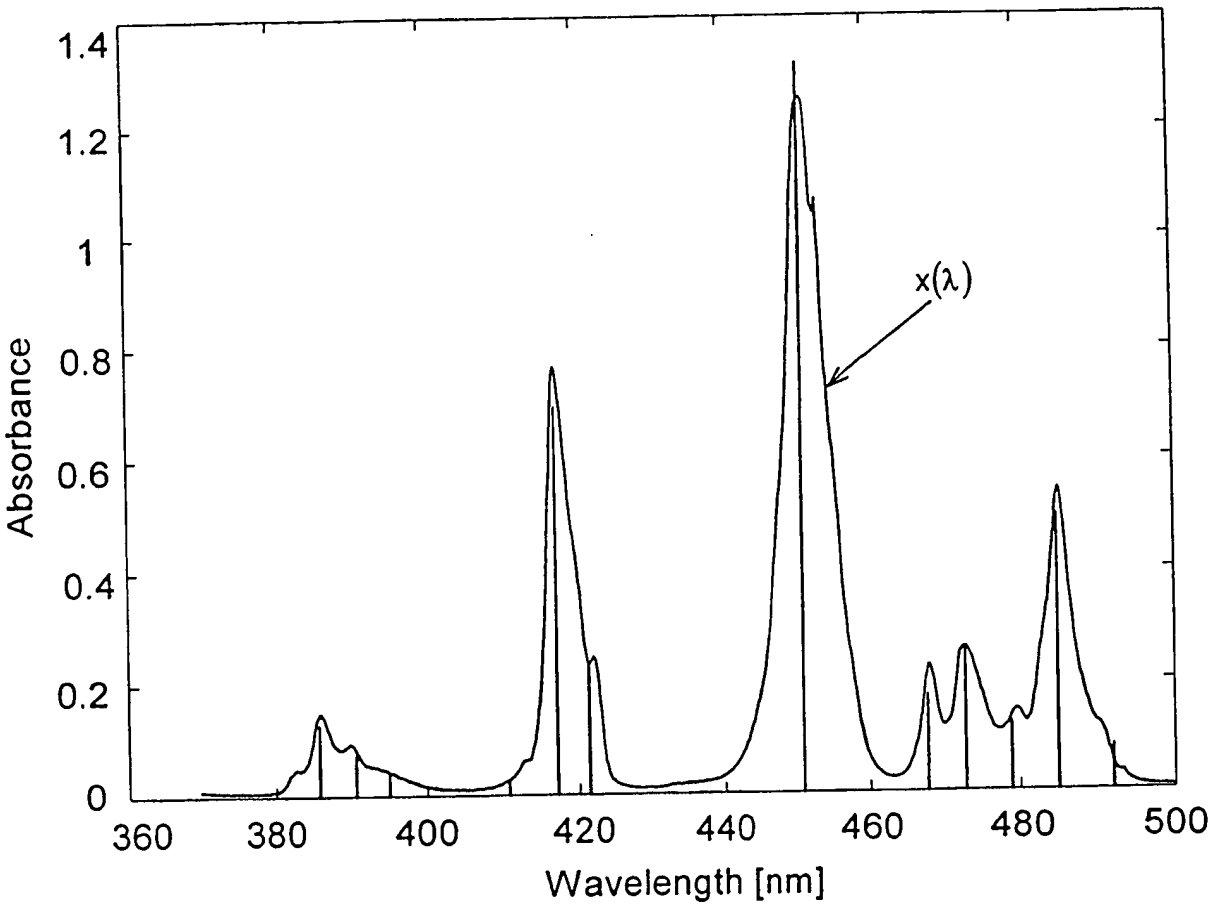
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Absorbance
x(λ)
360
380
400
420
440
460
480
500
Wavelength [nm]

Figure 16

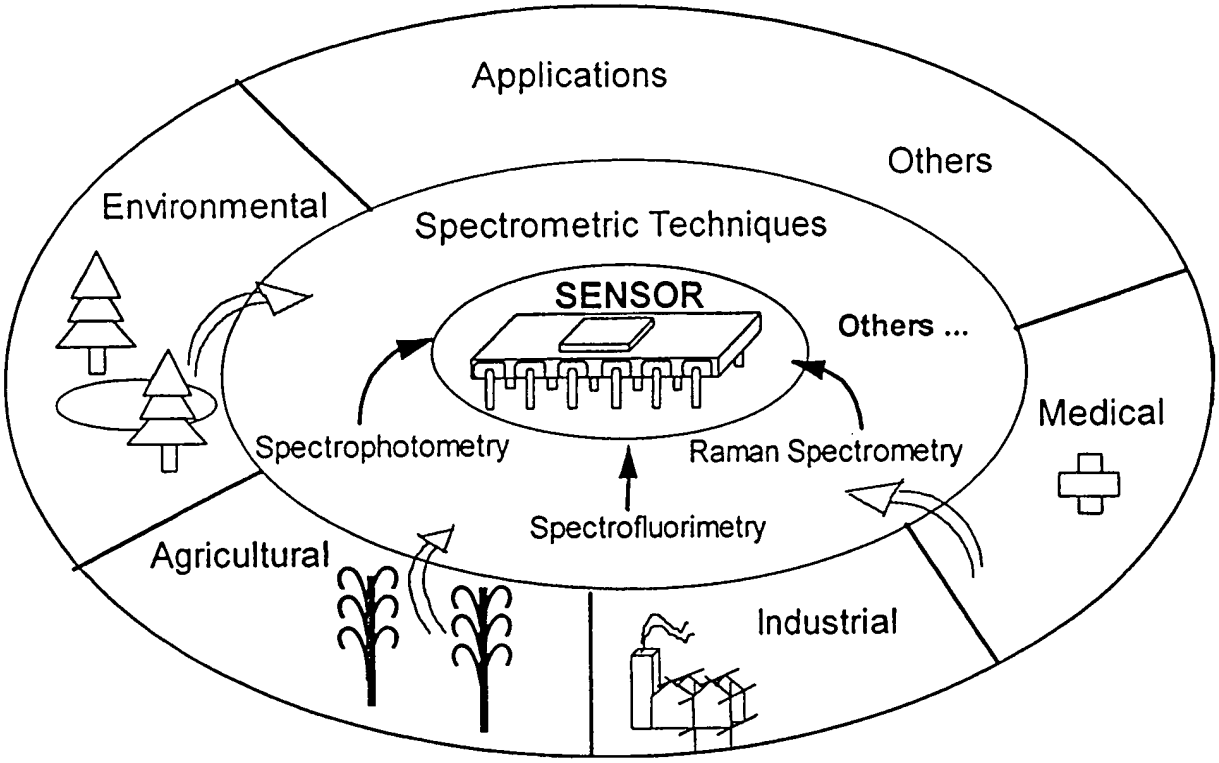
Applications
Others
Environmental
Spectrometric Techniques
SENSOR
Others ...
Medical
Spectrophotometry
Raman Spectrometry
Spectrofluorimetry
Agricultural
Industrial

Figure 17